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ABSTRACT

Research on the comparative cognition and cognitive functioning of bilinguals is reviewed for insight into research needed to facilitate the development of reasoning skills in language minority students. Studies of formal reasoning among persons with limited schooling in Central Asia, West Africa, and Mexico are noted and discussed in the context of schema theory and parent educational background. Language minority students with little formal schooling in their own language are reported to have had difficulties in interpreting formal reasoning problems. The students often refuse to interpret problems as meaningful because the problems included persons, objects, and events that were not a part of their everyday life. Future research will address how language minority students' acquisition of schemata for language forms such as transition expressions may affect their ability to reason effectively in a second language. (MSE)

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REASONING SKILLS OF LANGUAGE MINORITY STUDENTS

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University of California, Santa Barbara

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INTRODUCTION

Reasoning is important to success in schools, but mastering the reasoning requirements of schooling can present more difficulties for language minority than for non-minority students. Language minority students come from home and community backgrounds where a non-English language is spoken and where there may be familiarity with a different culture. This paper presents some of the principal findings from the research on comparative human cognition and cognitive functioning of bilinguals. It also identifies needed research which could lead to educational interventions that would facilitate the development of reasoning skills among language minority students.

Culture, Language, and Human Cognition

Researchers in the area of comparative human cognition investigate how people reason and solve problems in their everyday lives. Scribner (1979) surveys some of the important findings in this research field. She cites studies of formal reasoning among non-schooled persons residing in Central Asia, West Africa, and Mexico. These studies found that individuals, who had little formal schooling, had difficulties in interpreting formal reasoning problems. Individuals often refused to interpret problems as meaningful, because the problems referred to persons, objects, and events that were not a part of their everyday life, as in the case of Mr. Smith in the following example:

> All Kpelle men are rice farmers.
>
> Mr. Smith is not a rice farmer.
>
> Is he a Kpelle man?

However, the most important point raised by Scribner is that learning to reason in ways induced by schooling amounts to learning

mental schemata for performing thinking under certain circumstances. Schema (plural "schemata") are theoretical entities used by psychologists to explain the organization and functioning of human memory. Schema are the organized chunks of knowledge that people have about ideas and about the world at large. The term schema also may refer to knowledge about how to think, act, and use language. Thus, the concept of schema encompasses both knowledge in its static sense and knowledge about procedures.

From the viewpoint of schema theory, persons who are exposed to formal schooling acquire schemata for reasoning about syllogism problems and other forms of reasoning problems. These schemata, however, do not exist detached from peoples' experiences, as evidenced by the finding that counterfactual syllogisms and nonsense syllogisms are harder for schooled adults to solve than syllogisms which make common sense (Revlin & Mayer, 1978). These "difficult" syllogisms contain sentences whose meanings are contrary to experience, as in "All canaries are red" or "All plunks are tunks."

Scribner (1979) also suggests that use of cognitive schemata to perform reasoning is tied to intimate familiarity with the way language is used to express problems. She suggests that there are close connections with the genre of problems and the way persons interpret the reasoning demands of problems. This view would hold, for example, that school tasks such as solving verbal arithmetic problems require that students know a lot about the style of language and the language register used to express the problems.

Investigators such as Olson (1984) go one step further by suggesting that the early socialization of children whose parents have formal

education, exposes children to a metalanguage of value to reasoning at school. This metalanguage is used to talk about ideas and thinking, as in the case of verbs like mean, intend, think, know, pretend, wonder, decide, realize, remember, doubt, and deny. These verbs, which are used as tools for reasoning and thinking, become embodied in formal study at school, and their use outside of school marks the speaker as having had at least some formal schooling.

Needed Research on Bilingualism, Language Schemata, and Reasoning

The foregoing issues are important to consider in carrying out research on the reasoning skills of language minority students, but two key questions remain unanswered.

(1) Do language minority persons possess the cognitive schemata required by problem solving tasks?

Research suggests that bilinguals can solve simple deductive reasoning problems in each of the two languages by utilizing the same cognitive schemata for interpreting problems. In the case of verbal syllogism problems, research indicates that bilinguals tend to be equally accurate in each of their two languages, or only slightly less accurate in their less familiar language (d'Anglejan et al., 1979; Durán, 1985; Mestre, 1984). In one study, a correlation of .96 was found between college bilinguals' ability to solve the same underlying syllogism problems in two languages (Durán & Enright, 1983). However, the generalizability of the foregoing findings to a variety of bilingual populations needs to be investigated.

Apart from studies of syllogistic reasoning, there have been very few studies of bilinguals' high-level reasoning performance in two languages. A study by Goldman, Reyes, and Varnhagen (1984), for

example, found that bilingual children's recall of fables delivered in Spanish and English reflected the same underlying inferences about story structure and story meaning. An early study by Macnamara and Kellaghan (1968) found that Irish bilinguals had more difficulty in solving arithmetic reasoning problems in English, their less familiar language, than in Irish, their more familiar language. It may be that as problems become more complicated and demanding, the bilinguals' ability to represent and work problems in a less familiar language suffers due to the added effort required in processing the language of problems. However, despite this caveat, existing research evidence suggests that bilinguals can be very resourceful in utilizing the same cognitive schemata when presented problems in two languages. Additional insights on the implications of this result for the cognitive development of bilingual background children are provided by Hakuta (1986). He concludes that some of the cognitive skills of bilinguals might be enhanced by virtue of developing skills in two languages. The impact of bilingualism on the acquisition of higher order reasoning skills remains an open question for research.

(2) Do language minority persons possess the linguistic schemata necessary to understand and work problem solving tasks?

If Scribner and Olson are correct, then the development of reasoning skills by language minority students needs to be looked at carefully in light of the special forms of language knowledge that accompany verbal problem solving in a first or second language. At the discourse level, investigators such as Kaplan and his colleagues (Connor & Kaplan, 1987) have long suggested that second language behavior can reflect culturally specific rhetorical patterns and forms

of argumentation. This is not surprising to sociolinguists and anthropologists who study human communication (Gumperz & Hymes, 1972), but we have just begun to see empirical research on the linguistic schemata that are expected in schooling in the English language. One example concerns the development of second language learners' skill in recognizing and understanding function words and expressions that serve logical purposes in English, such as the so called transition expressions in English (Secord, 1978), terms such as and, but, because, and next which specify and build various kinds of logical connections among ideas expressed in a text. As research on second language develops in the coming years, we can expect that researchers will expend more effort in studying how the acquisition of schemata for language forms such as transition expressions affects the ability of second language learners to reason in the second language (e.g., Liu, 1985). Ultimately, research of this sort will help us better understand ways in which to improve instruction for English as a second language.

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